



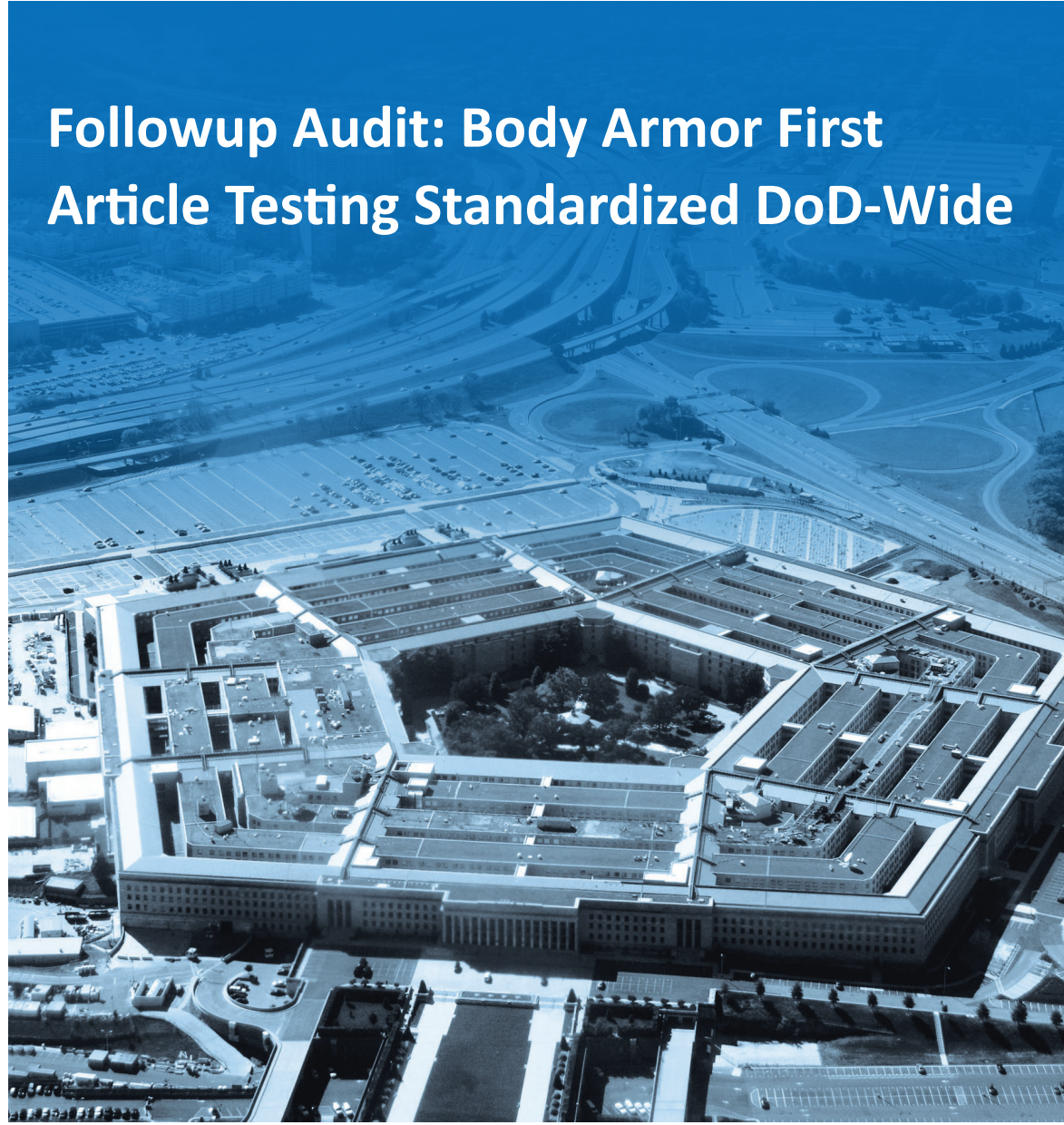
# INSPECTOR GENERAL

*U.S. Department of Defense*

JANUARY 28, 2014



## Followup Audit: Body Armor First Article Testing Standardized DoD-Wide



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# Results in Brief

## *Results in Brief: Followup Audit: Body Armor First Article Testing Standardized DoD-Wide*

January 28, 2014

### Objective

Our objective was to determine whether the Director, Operational Test and Evaluation, coordinated with the Military Services, U.S. Special Operations Command, and Defense agencies to develop the standardized, first article testing procedures for body armor ballistic inserts as agreed to in Recommendation B of DoD IG Report No. D-2009-047, "DoD Testing Requirements for Body Armor," dated January 29, 2009. Additionally, we determined whether the Military Services, U.S. Special Operations Command, and Defense agencies implemented the procedures to mitigate body armor testing inconsistencies.

### Findings

The Director, Operational Test and Evaluation coordinated with the Military Services, U.S. Special Operations Command, and Defense agencies to develop a standardized, first article testing procedures for body armor ballistic inserts as agreed to in Recommendation B. Specifically, the Director, Operational Test and Evaluation:

- collaborated with Army Test and Evaluation Command to develop a sample size for testing that limits the number of possible failures;
- coordinated the draft procedures; and

### Findings Continued

- issued the final procedures to address Recommendation B.

Further, the Military Services, U.S. Special Operations Command, and Defense agencies incorporated the procedures into their ballistic plates testing documents. This mitigated the issue of testing inconsistency.

### Management Comments

We provided a discussion draft. No written response to this report was required, and none was received. Therefore, we are publishing this report in final form.



Figure. Test Sample Mounted for Ballistic Testing  
Source: DoD OIG



**INSPECTOR GENERAL  
DEPARTMENT OF DEFENSE  
4800 MARK CENTER DRIVE  
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January 28, 2014

MEMORANDUM FOR COMMANDER, U.S. SPECIAL OPERATIONS COMMAND  
DIRECTOR, OPERATIONAL TEST AND EVALUATION  
DIRECTOR, DEFENSE LOGISTICS AGENCY  
NAVAL INSPECTOR GENERAL  
AUDITOR GENERAL, DEPARTMENT OF THE ARMY

SUBJECT: Followup Audit: Body Armor First Article Testing Standardized DoD-Wide  
(Report No. DODIG-2014-033)

We are providing this report for your information and use. Our objective was to determine whether the Director, Operational Test and Evaluation, coordinated with the Military Services, U.S. Special Operations Command, and Defense agencies to develop the standardized, first article testing procedures for body armor ballistic inserts as agreed to in Recommendation B of DoD IG Report No. D-2009-047, "DoD Testing Requirements for Body Armor," dated January 29, 2009. Additionally, we determined whether the Military Services, U.S. Special Operations Command, and Defense agencies implemented the procedures to mitigate body armor testing inconsistencies.

We considered management comments on a discussion draft of this report in preparing the final and revised the report as appropriate. No written response to this report is required.

We appreciate the courtesies extended to the staff. Please direct questions to me at (703) 604-8905 (DSN 664-8905).

A handwritten signature in black ink, reading "Amy J. Frontz", is positioned above the typed name.

Amy J. Frontz  
Principal Assistant Inspector General  
for Auditing

# Contents

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<b>Introduction</b>	1
Objective	1
DoD Testing Requirements for Body Armor	1
<b>DoD Standardized Body Armor Testing</b>	2
DOT&E Developed Testing Procedures	2
DoD Implemented Testing Procedures	3
DOT&E Procedures Standardized First Article Testing	3
<b>Appendix</b>	
Scope and Methodology	4
Use of Computer-Processed Data	4
Prior Coverage	5
<b>Acronyms and Abbreviations</b>	6



# Introduction

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## Objective

Our objective was to determine whether the Director, Operational Test and Evaluation (DOT&E) coordinated with the Military Services, U.S. Special Operations Command (USSOCOM), and Defense agencies to develop the standardized, first article testing procedures for body armor ballistic inserts as agreed to in Recommendation B of DoD IG Report No. D-2009-047, “DoD Testing Requirements for Body Armor,” dated January 29, 2009. Additionally, we determined whether the Military Services, USSOCOM, and Defense agencies implemented the procedures to mitigate inconsistencies in body armor testing.

## DoD Testing Requirements for Body Armor

We performed this followup audit on Recommendation B in DoD IG Report No. D-2009-047, the third audit in a series of congressionally requested reports on DoD body and armored vehicles.

The prior audit identified that the Army and USSOCOM independently developed, first article testing<sup>1</sup> (FAT) criteria for body armor ballistic inserts. Specifically, when testing the same ballistic threats, the Army’s and USSOCOM’s testing criteria differed significantly in the number of plates tested (sample size), shot pattern, environmental conditions, type of tests, and pass/fail guidelines. Because of this, DoD did not have assurance that its body armor provided a standard level of protection. As a result, DoD OIG recommended that DOT&E develop a test operation procedure for body armor ballistic inserts. Specifically, DOT&E should:

- involve the Military Services and USSOCOM to verify that the test operation procedure is implemented DoD-Wide;
- include at a minimum, requirements for sample size, shot pattern, types of testing, and acceptance criteria to verify the rigor of testing; and
- use quantitative methods to develop a sample size for testing that limits the number of possible failures.

DOT&E agreed with Recommendation B.

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<sup>1</sup> According to FAR Part 2.101, first article testing is the testing and evaluating of the first article for conformance with specified contract requirements before the initial stage of production.

## DoD Standardized Body Armor Testing

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DOT&E implemented the corrective actions for Recommendation B and the actions taken mitigated body armor testing inconsistencies. DOT&E coordinated with the Military Services, USSOCOM, and Defense agencies to develop a standardized FAT procedure<sup>2</sup> for body armor ballistic inserts. As a result, DoD had reasonable assurance that its body armor provided a standardized level of protection across all Military Services and USSOCOM for the warfighter.

### DOT&E Developed Testing Procedures

DOT&E worked with Army Test and Evaluation Command (ATEC) to develop a sample size for testing to limit the number of possible failures. ATEC recommended minimum requirements for sample size, shot pattern, types of testing and acceptance criteria to verify the rigor of testing. According to DOT&E, ATEC issued an assessment report that outlined the results from testing 2,400 ballistic plates. Based on this report, ATEC recommended a 60-plate sample size to achieve a 90 percent confidence level during testing. See Table for DOT&E minimum requirements.

DOT&E included ATEC results in the draft “Standardization of Hard Body Armor Testing” procedure on March 9, 2010. The objective of the procedures is to establish for DoD-Wide use, statistically derived test methods for hard body armor that will provide for increased confidence in the performance of personal protective equipment. The draft procedure was then coordinated with the Military Services, USSOCOM, and Defense agencies. DOT&E also requested comments from manufacturing and material providers and private industry laboratories. As a result of this coordination, DOT&E clarified the confidence levels, testing criteria, and definitions. DOT&E issued procedures for DoD Wide use on April 27, 2010.

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<sup>2</sup> DOT&E refers to the “Standardization of Hard Body Armor Testing” as the protocol. For the purpose of this report, protocol is referred to as procedure(s).



*Table. DOT&E's Standardized Minimum Requirements*

Minimum Requirements	
<b>Sample Size</b>	Testing of 60 plates against one ballistic threat <sup>3</sup> is the minimum to achieve the required statistical confidence level
<b>Shot Pattern</b>	<ul style="list-style-type: none"> <li>• <u>Ambient Plates</u> -Two shots are fired at each plate; one at the crown and one at the edge</li> <li>• <u>Impact Conditioned Plates</u> -Two shots fired at each plate; one at location of most severe crack and second at any edge</li> </ul>
<b>Types of Testing</b>	Testing to determine resistance to penetration during exposure to 10 environmental conditions <sup>4</sup>
<b>Acceptance Criteria to Verify Rigor Test</b>	Outlines shot acceptance based on the degree of penetration <sup>5</sup> to ballistic plate and back-face deformation cannot exceed 44mm

## DoD Implemented Testing Procedures

The Army, USSOCOM and DLA incorporated the procedures in their ballistic plates testing documents, which consisted of purchase descriptions, test plans, and performance specifications. Aberdeen Testing Center (ATC) conducts FAT for Army, USSOCOM, and Defense Logistics Agency to ensure consistency in the use of the procedures. After testing, ATC provided comparable results to these components to ensure the consistency of data.

Our review of the test results showed that the FAT was conducted to determine the compliance with the procedures. According to body armor personnel at the three Components, they used ATC test results when deciding to qualify body armor for full-rate production.

## DOT&E Procedures Standardized First Article Testing

Implementation of the procedures addressed Recommendation B and mitigated body armor testing differences by standardizing FAT of body armor ballistic inserts. Specifically, DOT&E set minimum requirements for sample size, shot pattern, types of testing and acceptance criteria that were used DoD-Wide. Additionally, DOT&E's FY 2012 report stated, "the Services and USSOCOM continue to implement rigorous, statistically based testing protocols for hard body armor inserts."

<sup>3</sup> A ballistic threat is a projectile that is fired from a weapon.

<sup>4</sup> Environmental conditions include: ambient, temperature cycling, JP-8 (fuel) soak, oil soak, salt water, weathering, high temperature, low temperature, altitude, and impact.

<sup>5</sup> The degrees of penetration are partial penetration of the plate/partial penetration of the system; complete penetration of the plate/partial penetration of the system; and complete penetration of the plate/complete penetration of the system.

## Appendix

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### Scope and Methodology

We conducted this performance audit from July 2013 through December 2013 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objective. We believe the evidence obtained provides a reasonable basis for our conclusions based on our audit objective.

We focused our audit on the coordination, development, and implementation of DOT&E's "Standardization of Hard Body Armor Testing," April 2010, to address Recommendation B in DoD IG Report No. D-2009-047. We reviewed results of FAT conducted after May 2010 for front and back ballistic inserts.

We conducted interviews with DOT&E personnel and personnel responsible for body armor testing from the Army, Marine Corps, USSOCOM, and DLA. Additionally, we conducted site visits at the following locations: DOT&E, Washington, DC; Army and Defense Logistics Agency Fort Belvoir, Virginia; Marine Corps, Quantico, Virginia; and ATEC, Aberdeen Proving Grounds, Maryland.

We performed field work to review the implementation of the procedures. Specifically, we reviewed final testing reports, test plans, purchase descriptions, and test results for FAT to determine if all DoD Components were implementing DOT&E's "Standardization for Hard Body Armor."

### Use of Computer-Processed Data

To perform this audit, we used computer processed data captured in the FUSION database. We compared the first article test reports within FUSION to DOT&E's Standardization for Hard Body Armor Testing, and we did not find significant discrepancies. Based on our review, we determined that the data was sufficiently reliable for the purpose of this audit.

## Prior Coverage

During the last 5 years, the Government Accountability Office (GAO), Department of Defense Inspector General (DoD IG), and Army Audit Agency issued six reports related to body armor testing. Unrestricted copies of GAO reports can be accessed [www.gao.gov](http://www.gao.gov); unrestricted DoD IG reports can be accessed at <http://www.dodig.mil/pubs/index.cfm>; and unrestricted Army reports can be accessed at <https://www.aaa.army.mil>.

### **GAO**

Report No. GAO-10-119, "Independent Expert Assessment of Army Body Armor Test Results and Procedures Needed Before Fielding," October 2009

### **DoD IG**

Report No. D-2008-067, "DoD Procurement Policy for Body Armor," March 31, 2008

Report No. D-2011-088, "Ballistic Testing for Interceptor Body Armor Inserts Needs Improvement," August 1, 2011

### **Army**

Report No A-2009-0086-ALA, "Body Armor Testing," March 30, 2009

Report No. A-2011-0082-ALA, "Implementing Body Armor Recommendations," April 15, 2011

Report No. A-2011-0132-ALA, "Body Armor Testing Process," June 9, 2011

## Acronyms and Abbreviations

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<b>ATC</b>	Aberdeen Test Center
<b>ATEC</b>	Army Test and Evaluation Command
<b>DLA</b>	Defense Logistics Agency
<b>DOT&amp;E</b>	Director, Operational Test and Evaluation
<b>FAT</b>	First Article Testing
<b>USSOCOM</b>	United States Special Operations Command





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